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L1: (659) 606/142

L2: (522) 606/143

L3: (479) ((("606/142") or ("606/143")).CCLS.

(1) fabric same (antimicrobial or silver or zinc) same (coating or coated) same (heart adj

(5) fabric same (silver or zinc) and (heart near3 valve or suture near3 ring or sewing near

(3) ((("5674280") or ("5895420")).PN.

(107) ((("623/2.12") or ("623/2.17") or ("623/2.18") or ("623/2.28") or ("623/2.31") or ("62

(55) ((("623/2.33") or ("623/2.42") or ("623/2.20")).CCLS.

(238) ("8/94.11").CCLS.

(907) ((("606/149") or ("606/150") or ("606/151") or ("606/153")).CCLS.

(122) ((("623/2.11") or ("623/23.68") or ("623/2.41")).CCLS.

(1) ("5716370").PN.

(11) ((("3657026") or ("5250058") or ("5261920") or ("5571116") or ("5707380") or ("5716370"

(11) ((("3657744") or ("5250058") or ("5261920") or ("5571116") or ("5707380") or ("5716370"

(115) (((("606/149") or ("606/150") or ("606/151") or ("606/153")).CCLS.) and valve

(5) (((("3657744") or ("5250058") or ("5261920") or ("5571116") or ("5707380") or ("5716370"

USPAT: EPO: JPO

606/142

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| | Search Terms | Total | USPAT | USOCR | EPO | JPO | Derwent | IBM TI |
|---|--|-------|-------|-------|-----|-----|---------|--------|
| 1 | 606/142. EX70, EX80, EX90, JX70, JX80, JS90, JS95, JS00, U200, UX00, UX50, UG71, UG72, UG73, UG74, UG7 285 | | | | | | | |
| 2 | 606/143. EX70, EX80, EX90, JX70, JX80, JS90, JS95, JS00, U200, UX00, UX50, UG71, UG72, UG73, UG74, UG7 259 | | | | | | | |
| 3 | (606/143 606/142).CCLS. | 479 | | | | | | |

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| 1 | US 3657744 | | USPAT | 1972042 | 6 |
| 2 | US 5250058 | | USPAT | 1993100 | 14 |
| 3 | US 5261920 | | USPAT | 1993111 | 9 |
| 4 | US 5571116 | | USPAT | 1996110 | 32 |
| 5 | US 5707380 | | USPAT | 1998011 | 24 |
| 6 | US 5716370 | | USPAT | 1998021 | 32 |
| 7 | US 5720755 | | USPAT | 1998022 | 59 |
| 8 | US 3657744 | | EPO | 1972042 | 6 |
| 9 | US 5250058 | | EPO | 1993100 | 14 |
| 10 | US 5571116 | | EPO | 1996110 | 32 |
| 11 | US 5720755 | | EPO | 1998022 | 59 |

United States Patent (19)
Miller et al.

US0525005A
[11] Patent Number: **5,250,058**
[43] Date of Patent: **Oct. 6, 1993**

[34] **ABSORBABLE ANASTOMOSIC FASTENER MEANS**
[73] Inventors: Michael R. Miller; Mark S. Zehner, both of Cleveland, Ohio; James A. Truena, Bridgewater, N.J.
[79] Assignee: Ethicon, Inc., Somerville, N.J.
[21] Appl. No.: 708,860
[22] Filed: Jan. 5, 1991

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Primary Examiner—Stephen C. Pellegrino
Assistant Examiner—Cory Jackson
Attorney, Agent, or Firm—Paul A. Coleri

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 642,464, Jan. 17, 1991.
[51] Int. Cl. A61B 17/00
[52] U.S. Cl. 606/184; 606/193; 606/230; 24/615; 411/437; 411/509
[53] Field of Search 606/153; 154; 210; 227/179; 411/709; 427; 512; 433; 908; 918; 24/616; 615; 590; 598; 621; 291; 297

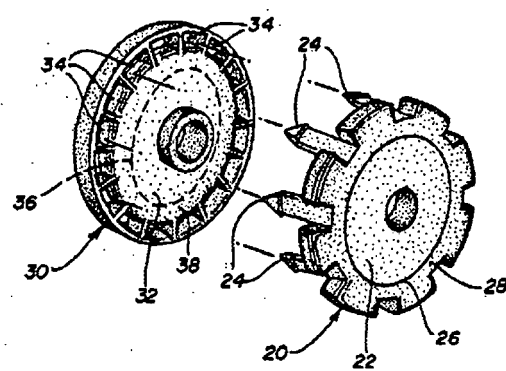
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ABSTRACT

A mechanism which is capable of anastomosis of two lumens by an absorbable fastener. The fastener is made from two washer-like plates. One such plate has holes to receive latching prongs protruding from the other plate. Fastening is done through a single linear motion that causes the prongs to pierce the tissue, latches the prongs into a receiver and causes a knife blade to cut through excess fastener material and tissue. The ease of removal, by pulling the mechanism through the formed anastomosis, is greatly enhanced. The system can be used such that the plates can be placed in any configuration to properly anastomose tissue.

16 Claims, 9 Drawing Sheets



| Document | Kind Code | Source | Page No | Pages | Class |
|----------|------------|--------|---------|-------|-------|
| 1 | US 6030392 | USPAT | 2000022 | 25 | Cc |
| 2 | US 5904696 | USPAT | 1999051 | 12 | 8f |
| 3 | US 5897562 | USPAT | 1999042 | 30 | Nc |

United States Patent [19]
Dakov

Patent Number: 6,030,392
Date of Patent: Feb. 29, 2000

[54] CONNECTOR FOR HOLLOW ANATOMICAL STRUCTURES AND METHODS OF USE

[75] Inventor: Pepi Dakov, New York, N.Y.
[73] Assignee: Motorola, Inc., Schaumburg, IL
[21] Appl. No.: 08/858,275
[22] Filed: May 19, 1997

Related U.S. Application Data

[63] Continuation-in-part of application No. 08/538,436, Oct. 2, 1995, Pat. No. 5,720,755, which is a continuation-in-part of application No. 08/274,043, Jan. 18, 1995, abandoned.

[51] Int. Cl. A61B 17/03
[52] U.S. Cl. 606/139; 606/148; 606/151
[58] Field of Search 606/139, 148, 606/152, 153, 151; 623/1; 222/175.1, 175.1, 179.1

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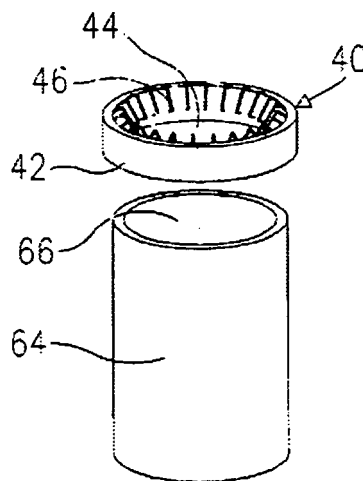
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Primary Examiner—Michael Ruiz
Assistant Examiner—Daphna Shai
Attorney, Agent, or Firm—Charles W. Bethards

[57] ABSTRACT

Connector and methods for attachment to hollow anatomical structures. The connector consists of an annular rigid body and multiple holding members affixed along its opening. The opening and the inner surface and of the annular body correspond respectively to the opening and the external surface of a hollow anatomical structure. The holding members are deformed by an applied force in a manner that the deformed holding members protrude into the opening of the hollow structure and press it towards the annular rigid body, thus attaching the connector to the hollow anatomical structure. Various embodiments of connectors and methods are provided for attaching the connectors to hollow anatomical structures with different external surfaces.

22 Claims, 14 Drawing Sheets



| Document | Kind | Code | Source | Page |
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| 1 | US | 6042607 | USPAT | 2000032 :62 |
| 2 | US | 5871489 | USPAT | 1999021 18 |
| 3 | US | 5716370 | USPAT | 1998021 :32 |
| 4 | US | 5314473 | USPAT | 1994052 7 |

United States Patent [19] [11] **Patent Number:** 6,042,607
Williamson, IV et al. [45] **Date of Patent:** *Mar. 28, 2000

- [54] **MEANS AND METHOD OF REPLACING A HEART VALVE IN A MINIMALLY INVASIVE MANNER**
- [75] **Inventors:** Warren Williamson, IV, Loveland, Ohio; Paul A. Spence, Louisville, Ky.; George T. Christakis, Toronto, Canada; Thomas J. Ward, Grandview Heights, Ohio; Dominic P. DiNovo, Columbus, Ohio; George A. Keller, Grandview Heights, Ohio; Cecil R. Robinson, Hilliard, Ohio; E. Dale VanHoose, Columbus, Ohio
- [73] **Assignee:** CardioVascular Technologies LLC, Loveland, Ohio
- [*] **Notice:** This patent is subject to a terminal disclaimer.
- [21] **Appl. No.:** 08/802,948
- [22] **Filed:** Feb. 21, 1997

Primary Examiner—Paul B. Prebille
Attorney, Agent, or Firm—Terry M. Gerstein

[57] **ABSTRACT**
A heart valve can be replaced using minimally invasive methods which include a sutureless sewing cuff that and a fastener delivery tool that holds the cuff against the patient's tissue while delivering fasteners, two at a time to attach the cuff to the tissue from the inside out. The tool stores a plurality of fasteners. Drawstrings are operated from outside the patient's body and cinch the sewing cuff to the valve body. The cuff is releasably mounted on the tool and the tool holds the cuff against tissue and drives the fastener through the cuff and the tissue before folding over the legs of the fastener whereby securement between the cuff and the tissue is assured. At least two rows of staggered fasteners are formed whereby fasteners are located continuously throughout the entire circumference of the cuff. A minimally invasive surgical method is disclosed, and a method and tool are disclosed for repairing abdominal aortic aneurysms in a minimally invasive manner.

- Related U.S. Application Data**
- [63] **Continuation-in-part of application No. 08/805,343, Feb. 23, 1996, Pat. No. 5,715,370.**
- [51] **Int. Cl. 7** A61F 2/24
- [52] **U.S. Cl.** 623/2; 623/11; 606/153; 606/151
- [56] **Field of Search** 623/2, 11; 606/149; 606/150, 151, 153

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104 Claims, 41 Drawing Sheets

